Knowledge, Perception, and Awareness of Dog-related Zoonoses in Uyo Metropolis, Nigeria.

Abstract

The interaction of humans and animals especially dogs, has made zoonotic diseases remain a genuine threat to the health and survival of humans, a study aimed at assessing the level of knowledge and risk perception of dog owners regarding canine and their zoonotic potential was carried out in Uyo, Akwa, Ibom using structured questionnaires. A total of 200 respondents were employed for the study and all (100%) were aware that some animal diseases (zoonoses) are transmissible to humans, including those of dogs. Although a high level of awareness of 100% (200) was recorded for rabies and its route of transmission (bite) and 75% (157) for dermatophytosis while 96.5% (193) were ignorant on dog helminthic zoonosis. Some of the encountered factors that predisposed infectivity included: compromised sanitary conditions of the kennel (50%), inappropriate disposal of dog feces (51.5%), poor veterinary attention (58%), and feeding of dogs with both raw animal products and household leftovers (53%). This revealed a high potential of zoonotic infectivity among the human population in the area, mostly on zoonotic helminth infections, as they were misperceived. Therefore, there is a need for increased awareness, strategy formulation, and implementation toward the control and eradication of zoonotic diseases.

Keywords: Zoonoses, Dogs, Awareness, Veterinary

Introduction

Zoonoses are diseases that are naturally transmitted between animals and humans. Zoonoses constitute a diverse group of viral, bacterial, rickettsial, fungal, parasitic, and prion diseases with a variety of animal reservoirs, including wildlife, livestock pet animals, and birds (Nkuchia et al., 2007). In most cases, animals play an essential role in maintaining infection in nature and contribute to varying degrees to the distribution and actual transmission of infection in human and animal populations. These diseases have a variety of transmission mechanisms that may be direct, such as in rabies and anthrax, or indirect, via vectors, food, water, and the environment, as in the case of cysticercosis. Some diseases, such as brucellosis, have multiple routes of infection. With the constant and inevitable interaction of humans and animals, zoonotic diseases remain a genuine threat to the health and survival of people, their livestock, companion animals, and wildlife (WHO, 2017).

Worldwide, dogs are one of the most common household companion animals, and have been reported to contribute to the physical, social, and emotional well-being of humans (Dohoo et al., 1998; Robertson et al.2000: McCarthy and Moore, 2000). Because of their close proximity to humans, they can be a direct or indirect source of many zoonotic infections (Morrison 2001). A wide range of zoonotic infections have been documented that can be transmitted from dogs (Eliot et al., 1985: Ugbomoiko et al., 2008), some of which include some helminthic infections such as Toxocara infection in humans resulting in visceral larva migrans, sometimes leading to blindness (Taylor, 2001) and hookworm infection in humans resulting in cutaneous larva migrans (Heukelbach et al., 2005). The Centers for Disease Control and Prevention (CDC) reported that worldwide, an estimate of 1 to 3 million people are zoonotically infected with Toxocara migrans

every year. In addition to endoparasites, dogs also harbor ectoparasites, which are known to be vector to some zoonotic diseases (CDC, 2014), such as fleas, which are known to transmit human plague rickettsiosis murine typhus, and leishmaniasis [Courtinho and Linardi, 2007], and serve as intermediate hosts for dog tapeworm (*Dipylidium caninum*). *Rhipicephalus* ticks are known to parasitize humans (Dantas-Torres et al., 2006) and vector rickettsial diseases and visceral leishmaniasis. (Coutinho et al., 2005).

Fortunately, most of these infections can be clinically prevented by appropriate prophylactic interventions (Irwin, 2002), but this is not the case in most tropical regions, as zoonosis remains a major challenge. Limited information exists on the level of knowledge and risk perception of dog owners regarding canine and their zoonotic potential. Therefore, this work is aimed at bridging the gap with the intention of providing baseline information that will facilitate the development of effective joint veterinary–medical policies and guidelines for controlling zoonotic diseases (dog zoonosis) in the area, as information assessing practices and attitudes among at-risk populations can provide a suitable format to evaluate existing programs and to identify effective strategies for behavioral changes.

Materials and methods

Study area and population

This study was conducted among dog owners in Uyo Metropolis, the capital city of Akwa Ibom State of Nigeria. Uyo is at latitude 5.02° North and longitude 7.92° East. It is within the tropical belt with evergreen foliage of trees, shrubs, and oil palm trees, and two distinctive climatic seasons, namely, the wet season, which lasts between April and October, and the dry season, which lasts between November and March. The dry season experiences harmattan during December and January. It has an annual rainfall of 3300 mm with a landmass of 95 km^2 (Udotong et al., 2008). The population of Uyo metropolis is estimated to be approximately 1.3 million, and the indigenes are mainly the Ibibio-speaking tribe. As a center of commerce, the population increases every day due to the high level of rural–urban migration. The inhabitants are public servants, traders, and farmers (World Population Prospect, 2022).

Data Collection

A semi-structured questionnaire was used to obtain data from the participants, which comprised randomly selected dog owners within the study area. A total of 200 dog owners made up the study population and responded to an interviewer-guided questionnaire that, probed demographic data and information on knowledge, attitudes, and risk factors related to zoonoses, with a particular emphasis on dog zoonoses. It was designed to be completed within 20 min for an average respondent. All technical terms in the questionnaire were translated into the Ibibio language and explained by the interviewer. Confidentiality was assured to each participant, and demographic data of the study participants, including sex, marital status, and educational status, were collected and presented in a tabular format.

Statistical Analysis

The collected data were processed using SPSS version 20 (IBM Corp., Armonk, NY, USA). The Fisher exact test was used to evaluate the significance of differences, with $P \leq 0.05$ considered to indicate significant differences. Frequency and percentage were computed for all variables.

Ethical statement

Verbal consent was obtained from each participant before data collection.

RESULTS

Of the 200 participants, more were female (67.5%) than male (32.5%) (Table I). As reported by the respondents, 65.5% (131) were single and 34.5% (69) were married. In terms of educational status, 66% (132) of the respondents had a secondary education, 22.5% (45) had only a primary education, 10% (20) had a tertiary education, and 3 (1.5%) of the respondents had no form of formal education.

Table I: Demographic characteristics

Variables	Frequency	Percentage
Sex		
Male	65	32.5
Female	135	67.5
Educational status		
Primary	45	22.5
Secondary	132	66
Tertiary	20	10
None	3	1.5
Marital status		
Married	69	34.5
Single	131	65.5

Table II: Zoonotic disease awareness

Variable	Frequency (%)	χ2	P-value
Awareness of diseases that are transmissible from animals to humans			
Yes	200 (100)		
No`	-		
Awareness of intestinal nematode parasites of dogs that can be transmissible to humans			
Yes	7	86.49	<0.05*
No	193		
Have your dog ever been diagnosed any disease probably transmissible to humans			
Yes	84(42)	2.56	<0.05*
No`	-		
No idea	116(58)		
Member of your household being Diagnosed of any disease(s) linked to the presence of dogs in your house			
Yes	-		
No	75 (37.5)	6.25	<0.05*
No idea	125 (62.5)		

Table III: Knowledge on some dog-related zoonotic diseases

Variable	Frequency (%)	χ2	P-value
Helminthic infections			
Visceral larva migrans	7(3.5)	147.92	<0.05
Cutaneous larval	7(3.5)		
Echinococcosis/Cysticercosis	7(3.5)		
Insect-related dog zoonoses			
Human plague, Rickettsioses, Murine typhus and Leishmaniasis(flea)	157(78.5)	2.07	5.91
Rickettsial Diseases and Visceral leishmaniasis (*Rhipicephalus* ticks)	175(87.5)		
Scabies (mites)	150(75)		
Protozoan infections			
Giardiasis	102(51)	37.78	<0.05
Cryptosporidium infection	10(5)		
Virus infections			
Rabies	200(100)	85.95	<0.05
Norovirus infection	10 (5)		
Bacterial infections			
Salmonellosis	10(5)	59.96	1.000
Campylobacteriosis	7 (3.5)		
Pasteurella infection (cellulitis)	70 (35)		
Leptospirosis(spirochete)	59 (29.5)		
Capnocytophaga infection	50 (25)		
Staphylococcus infection	150 (75)		
Bordetella infection (pertussis/whooping cough)	13 (6.5)		
Yersiniosis	2 (1)		
Q-fever	10 (5)		
Fungi infections			
Dog ringworm/dermatophytosis	157(78.5)		

Table IV: Awareness on dog zoonotic disease transmission

Variables	Frequency (%)	χ2	P-value
Bite from dogs			
Yes	200 (100)		

No	-		
Washing hands after handling dogs			
Yes	183 (91.5)	68.89	<0.05*
No	17 (8.5)		
Presence/sanitary condition of kennels in houses with dogs			
Yes	7 (3.5)	86.49	<0.05*
No	193 (96)		
Restriction of dog movement within the house			
Yes	33 (16.5)	246.89	1.0000
No	167(83.5)		
Sharing of food and drinking water sources and household utensils with dogs			
Yes	5(2.5)	45.25	1.0000
No	195(97.5)		
Restriction of children's playgrounds at home			
Open space	86(43)	82.02	1.0000
Indoor	12 (6)		
Open space/indoor	102 (51)		
Disposal of dog feces			
Manure	103(51.5)	73.95	1.0000
Burying	47(23.5)		
Allowed to decompose on its own	6(3)		
Refuse bin outlet	44(22)		

Table V: Veterinary attention

Variable	Frequency (%)	χ2	P-value
Does your dog have any form of veterinary attention?			

Yes	200 (100)		
No	-		
What form of veterinary attention your dog get?			
Visit the veterinary clinic	20(10)		
Visit form the veterinary doctor	64(32)		
Other forms (such as self-administration of drugs, use of herbs and leaves extracts, etc.)	116 (58)	79.52	1.000
How often does your dog get Veterinary attention stated above?			
Weekly	-		
Monthly	-		
Quarterly	-		
Once every 6 months	10(5)		
Once a year	43(21.5)		
Only when necessary	147(58)	135.58	
What type of food do you give your dog?			
Raw animal products	12(6)		
Cooked animal product	8(4)		
Household leftovers	74(37)		
Raw animal products and Household leftovers	106(53)	169.2	

All the respondents were aware that some animal diseases are transmissible to humans as shown in Table II, including those of dogs, with 42% (84) reporting that their dogs at one point or another have been diagnosed with such diseases, while 58% (116) had no idea. However, none agreed to any member of their household being infected with any such disease. Regarding dog helminthic zoonosis, 3.5% (7) were aware 96.5% (193) were ignorant.

Only 3.5 % (7) of the respondents were aware that dog helminthic infections, such as visceral/cutaneous larva migrant and echinococcus, can be transmitted to humans as shown in Table III. Regarding insect-related dog zoonosis, 78.5% (157) were aware of murine typhus and leishmaniasis as zoonotic with Flea as the vector, 87.5% (175) were aware that rickettsial diseases are zoonotic with Rhicephalus tick as the vector, and 75% acknowledged scabies as zoonotic with mites as the vector. Approximately 51%–75% acknowledged that most of the diarrheal infections resulting from protozoans and bacteria such as giardiasis and salmonelosis could be because of dogs in their houses. High levels of awareness of 100% (200) and 75% (157) were recorded for rabies and dermatophytosis, which are viral and fungal infections associated with dogs, respectively.

Analysis of knowledge on the possible mode of transmission of some zoonotic diseases of dogs in Table IV showed that 100%(200) of the respondents were aware of dog bites as a major route of zoonotic disease transmission and 91.5% (183) were aware of the danger associated with not washing hands after handling or playing with dogs. The majority of the respondents (96.5%)

attested to having a kennel for their dog, but the sanitary condition of the doghouse was compromised by 50% of the population, while 3.5% had no provision for such a facility

The movement of dogs within the house was restricted by 16.5% (33) of the respondents, whereas 83.5% (167) gave their dogs access to their houses (bedroom). Five of the respondents (2.5%) agreed to sharing food, drinking water sources, and household utensils with their dogs. Children's playgrounds were restricted to indoors by 6% (12) of the respondents, whereas 43% (86) allowed children within their households to play in open spaces, and 51% (102) did not have restrictions on playgrounds as such they could play anywhere. The description of the open space included sandy soil in front of their houses (sand pits), fields, and streets (mostly untared). Regarding the manner in which they disposed of their dog feces, 51.5% (103) packed the feces only to dump them in a nearby garden or field around their houses (some as manure), 23.5% (47) buried the feces in holes. Regarding the depth of the holes in which the faces were buried, 18% (36) buried their dogs' feces in shallow holes while 5.5% (11) buried it in holes of about 8-12 inches. Feces were allowed to decompose at the site of defecation by 3% (6) of the respondents, especially if it was a field or sand pit.

All the respondents said their dogs were given veterinary attention, as shown in Table V. The forms in which the veterinary attention was given were as follows: 10% (20) of the respondents took their dogs to a veterinary clinic, 32% (64) had their dogs visited at home by a veterinary attendant, and 58% (116) gave their dog un-prescribed medication. The frequency in which the attention was given to the dogs was as follows: 5% (10) had veterinary attention once in six months, 21.5% (43) had it once a year while 73.5%(147) had it only when necessary (i.e when the dog is ill).

Regarding the type of feed given to the dog, 6% of the respondents (12) fed their dogs with raw animal products. Household leftovers were fed to dogs by 37% (74) of the respondents, while 53% (106) gave their dogs both raw animal products and household leftovers. Based on the discussion, it was reported that most of the dogs do not only feed on what they are given by their owners as their movements were not restricted as such the probability of feeding on contaminated organic matter such as feces, uncooked offal, etc. found within the surroundings was very high.

Discussion

The study revealed that all the respondents were aware of zoonotic diseases, which conformed to the report of Sandhu and Sing, 2019 in New York. Also, a higher percentage of the respondents had basic awareness of dog zoonosis, which varies with other studies, such as higher than the report of Bitsu et al. 2016, Amadi, et al. 2021, Issah et al. 2020, Vinus et al., 2020 but lower than the report of Zebede and Zekarias, 2022. This could be attributed to the outbreak of Ebola and COVID-19 which caused government and non-governmental organizations to increase /support the creation of zoonotic awareness using various media channels (Adams et al., 2023). The varying level of dog-related zoonosis specifically could be attributed to the varying educational level of

the respondents. In addition, most of the dog owners in the study acquired their dogs without any veterinary consultation and registration as such do not have formal guidelines/information related to dogs and their potential risk to their owners and other persons within the environment.

The most known dog-related zoonoses reported in the study were Rabbis and insect vector-related dog zoonosis. Rabbis is one of the most popular dog-related zoonosis known in most areas, as reported by Ahmed et al. 2023; Vinu et al. 2020; and Kebede et al., 2020, Alho, 2018, because it is associated with active transmission through dog bites. In Nigeria, it is one of the ten zoonotic diseases adopted by the one health approach (Ihekweazu et al., 2021). Insect vector-related dog zoonosis, which was also commonly acknowledged by the respondents, was also in accordance with the study of Sandhu and Singh, 2019. This could be attributed to the study location, which is a coastal region that serves as a habitat for various types of insect orders such as diptera, coleoptera, and hymenoptera, which are implicated as vectors of various zoonotic diseases (Alafia et al. 2023; Kehinde, 2017).

A low level of awareness was recorded for helminth zoonotic infections, which was lower than that reported by Alho et al., 2018, gross negligent of preventive measures such as provision and care of kennels, proper feeding with non-contaminated food (uncooked offal), and veterinary attention were also recorded in the study and could be attributed to the lack of proper awareness and poor perception of helminth infections by people in the area, which is encompassed as neglected tropical diseases in the study region. This agrees with Tesfaye et al. (2013), who acknowledged that the perception of the community on the risk factors and routes of transmission and life cycle of zoonotic diseases is a crucial step toward the development and implementation of appropriate disease prevention and Control strategies.

Conclusion

The study revealed a need for strategy formulation and implementation toward the control and subsequent eradication of zoonotic diseases in the tropics, which in most cases are neglected, especially in Nigeria, as most dogs among humans are not acquired with the consent of a veterinarian.

References

Adams, Eka and Ekott Emmanuel (2023) Anthelminthic Potential of *Vernonia amygdalina* on *Toxocara canis* in dogs. *Biotechnology Journal International* 27(6): 43-51

Ahmed, Z.A., Salah, H. M., Mohammed, M. O.S. and Mio, J. B. (2023). Public health awareness status of zoonotic diseases in Mogudisha, Somalia. *American Journal of Aquaculture and Science* 2(1): 7-12

Alafia, A. O., Ajelara, K. O., Onyema, H. E., Reis, G.A., Ogun, M. L. Anikwe, J.C., Denloye, A. A. and Makanjuola, W.A. (2023). Insect diversity and abundance in the three forest areas of Lagos state. *The zoologist* 22:40-47

Alho, A. M., Lima, C., Colella, V. deCarvalho, L. M., Otranto, D. O. and Cardoso, L.(2018) Awareness of zoonotic diseases and parasites control practices a survey of dog and cat owners in Qatar. Arasite and vector….

Amadi, A.N, Amadi, A.N.C. Obeten, P.I. and Chukwuemeka, B. C (2021). Prevalence of helminthes parasites among dogs and risk factors in bende Local Government Area, Abia State, Nigeria. *Nigerian Journal of Parasitology* 10(2): 58-63

Bitsu, K., Abdurahaman, A. H. and Eguale, T. (2016), Investigation on public knowledge, attitude and practices related tp pet management and zoonotic canine diseases in Addis Ababa, *Ethiopia Veterinary Journal* 20(1): 67-78

Centers for Disease Control and Prevention (CDC) (2014) http:// www.cdc.gov/ncezid/dvbd/ Retrieved on November 2023.

Coutinho, M. T. and Linardi, P. M. (2007) Can fleas from dogs infected with canine visceral leishmaniasis transfer the infection to other mammals? *Vet Parasitol* 147:320-5.

Coutinho, M. T., Bueno, L. L., Sterzik, A., Fujiwara, R. T., Botelho, J. R., De Maria, M., (2005) Participation of *Rhipicephalus sanguineus* (Acari: Ixodidae) in the epidemiology of canine visceral leishmaniasis. *Vet Parasitol.* 128:149-55.

Dantas-Torres, F., Figueredo, L. A. and Brandao-Filho, S. P. (2006). *Rhipicephalus sanguineus* (Acari: Ixodidae), the brown dog tick, parasitizing humans in Brazil. *Rev Soc Bras Med Trop* 39:64-7.

Dohoo, I. R., McDonell, W. N., Rhodes, C. S. and Elazhary, Y. L. (1998). Veterinary research and human health. *Can. Vet. Journal* 39:548-56.

Elliot, D. L, Tolle, S. W., Goldberg, L., Miller, J. B (1985). Pet-associated illness. *N Engl J Med* 313:985-95.

Heukelbach, J., Walton, S. F. and Feldmeier, H. (2005). Ectoparasitic infestations. *Curr Infect Dis Rep* 7:373-80.

Hundal, J.S., Sdhi, S.S. Gupta, A., Singh, J. and Chahai, U.S. (2016) Awareness, knowledge and risk of zoonotic diseases among livestock farmers in Punjab. Vet world 9(2): 186-19

Ihekweaza, C., Michael, C. A., Nguku, P. M., Waziri, N. E., Habib, A. G., Muturi, M., Olufemi, A., Dzikwi-Emennaa, A. A., Balogun, M. S., Visa, T. I., Dalhat, M. M., Atama, N. C., Umeokonnkwo, C. D., Mshelbwala, G. M., Vankuru, C. T., Kabir, J., Okolocha, E. C., Umoh, J.

J., Olugasa, B., Babalobi, Babalobi,, O., Lombin, L., Cadmus, S. (2021) Prioritization of zoonotic diseases of public healthsignificance in Nigeria using the one health Approach. One health 13: 100257

Irwin, P. J. (2002) Companion animal parasitology: Clinical perspective. *Int J Parasitol*. 32:591-3

Issah, B. Anash, T. and Alagma, H. A. (2020). Awareness of zoonotic diseases among pet owners in Wa municipality of Ghana. *UDS International Journal of Development* 7(2): 387-397

Kebede, T. and Zekarias, T. (2020) Perception of the public on the common zoonotic diseases and attitude to the one health approach in shalls district oromiya, *Ethiopia Veterinary Journal* 27(1): 60-72

Kehinde, T. O. (2017) Conserving Insect diversity in the Tropics: challenges and prospect. Nigerian Journal of Entomology 33: 7-15

McCarthy J. and Moore, T. A. (2000) Emerging helminth zoonoses. *Int J Parasitol* 30:1351-60.

Morrison G. (2001) Zoonotic infection from pets. Understanding the risk and treatment. *Postgrad Med* 110:24-6, 29-30, 35-6.

Nkuchia, M. M., Lynfield, R., Kathleen, G. J., Beneden, C. A. V and Henriette D. V (2007). Infectous diseases survelliance. Second Edition. 1-20p

Robertson, I. D., Irwin, P. J., Lymbery, A. J. and Thompson, R. C. (2000). The role of companion animals in the emergence of parasitic disease. *Int J Parasitol* 30:1369-77.

Sandhu, G.K. and Singh, D. (2019) Level of awareness regarding zoonotic diseases among dog owns of Ithace, New York. Journal of family medicine and primary care 3(4): 418-423

Taylor, M. R. (2001). The epidemiology of ocular toxocariasis. *J Helminthol* 75:109-18.

Tesfaye, D., Fekede, D., Tigre, W., Regassa, A., and Fekadu, A. (2013). Perception of the public on the common zoonotic diseases in Jimma, Southwestern *Ethiopia. International Journal of Medicine and Medical Sciences*, 5(6): 279-285

Udotung. I. R., Udoessein, E. I. and Sokari, T. I. J. (2008). *Akwa Ibom State Coastal Zone Management Framework for Sustainable Development*, Uyo, Nigeria.

Ugbomoiko, U. S., Ariza, L. and Heukelbach, J. (2008). Parasites of importance for human health in Nigerian dogs: High prevalence and limited knowledge of pet owners. *BMC Vet Res* 4:49.

Vinu, C., Dugg, P. and Khana, A. M (2020) Prevalence of pet dog ownership in an urban colony of east Dehli and awareness regarding canine zoonotic diseases and responsible pet ownership among dog owners. Indian journal of community medicine….

WHO (2017). Zoonoses: verterinary Public health www.whoint.zoonoses/Vph/en/accessed 20 December 2023

World Population Prospect (2022).Population Division https://www.macrotrends.net/cities/206379/uyo/ population'>Uyo, Nigeria Metro Area Population 1950-2024. www.macrotrends.net. Retrieved 2024-01-23